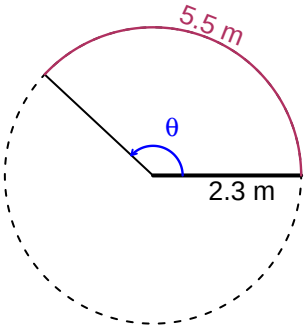
Name: Date:

Trig Final (SLTN v609)

- You should have a calculator (like Desmos) and a unit-circle reference sheet.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The radius is 2.3 meters. The arc length is 5.5 meters. What is the angle measure in radians?

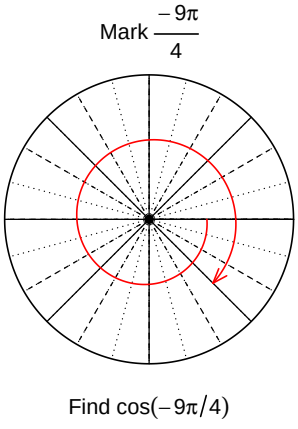


$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

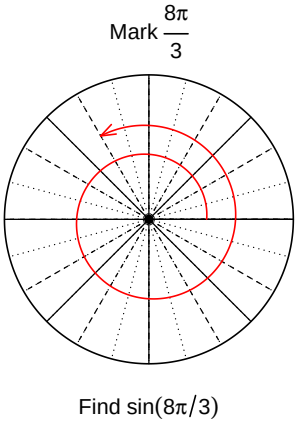
$\theta = 2.391$ radians.

Question 2

Consider angles $\frac{-9\pi}{4}$ and $\frac{8\pi}{3}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\cos\left(\frac{-9\pi}{4}\right)$ and $\sin\left(\frac{8\pi}{3}\right)$ by using a unit circle (provided separately).



Find $\cos(-9\pi/4)$



Find $\sin(8\pi/3)$

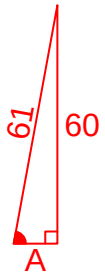
$\cos(-9\pi/4) = \frac{\sqrt{2}}{2}$

$\sin(8\pi/3) = \frac{\sqrt{3}}{2}$

Question 3

If $\sin(\theta) = \frac{-60}{61}$, and θ is in quadrant IV, determine an exact value for $\tan(\theta)$.

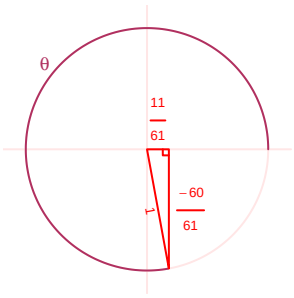
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$A^2 + 60^2 = 61^2$$
$$A = \sqrt{61^2 - 60^2}$$
$$A = 11$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant IV in a unit circle.



$$\tan(\theta) = \frac{\frac{-60}{61}}{\frac{11}{61}} = \frac{-60}{11}$$

Question 4

A mass-spring system oscillates vertically with a frequency of 5.42 Hz, an amplitude of 8.75 meters, and a midline at $y = -6.61$ meters. At $t = 0$, the mass is at the minimum height. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = -8.75\cos(2\pi 5.42t) - 6.61$$

or

$$y = -8.75\cos(10.84\pi t) - 6.61$$

or

$$y = -8.75\cos(34.05t) - 6.61$$